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west virginia department of environmental protection

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Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

Harold D. Ward, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Tuesday, August 3, 2021  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET  
DENVER, CO 80202

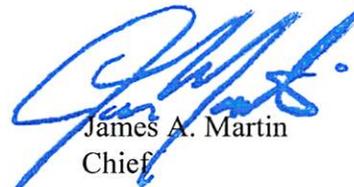
Re: Permit Modification Approval for RAPIDS UNIT 2H  
47-095-02738-00-00

**Extend Intermediate/Coal String 3050'.**

ANTERO RESOURCES CORPORATION

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.



James A. Martin  
Chief

Operator's Well Number: RAPIDS UNIT 2H  
Farm Name: JOHN SHEPHERD  
U.S. WELL NUMBER: 47-095-02738-00-00  
Horizontal 6A New Drill  
Date Modification Issued: 08/03/2021

Promoting a healthy environment.

08/06/2021

*Clk#  
231261  
\$2500*

STATE OF WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
WELL WORK PERMIT APPLICATION

1) Well Operator: Antero Resources Corporation 494507062 095-Tyler McElroy Shirley 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: Rapids Unit 2H Well Pad Name: Shepherd Pad

3) Farm Name/Surface Owner: John Shepherd Public Road Access: Sandy Creek Rd.

4) Elevation, current ground: 935' Elevation, proposed post-construction: ~935'

5) Well Type (a) Gas  Oil \_\_\_\_\_ Underground Storage \_\_\_\_\_  
Other \_\_\_\_\_  
(b) If Gas Shallow  Deep \_\_\_\_\_  
Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Marcellus Shale: 7100' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2850#

8) Proposed Total Vertical Depth: 7100' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 24000' MD

11) Proposed Horizontal Leg Length: 14592'

12) Approximate Fresh Water Strata Depths: 98'

13) Method to Determine Fresh Water Depths: 47-095-01482, 47-095-01434

14) Approximate Saltwater Depths: 1586'

15) Approximate Coal Seam Depths: None Identified

16) Approximate Depth to Possible Void (coal mine, karst, other): None Anticipated

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes \_\_\_\_\_ No

(a) If Yes, provide Mine Info: Name: \_\_\_\_\_  
Depth: \_\_\_\_\_  
Seam: \_\_\_\_\_  
Owner: \_\_\_\_\_

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Office of Oil and Gas  
JUL 29 2021  
WV Department of  
Environmental Protection

18)

**CASING AND TUBING PROGRAM**

<b>TYPE</b>	<u>Size (in)</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling (ft)</u>	<u>INTERVALS: Left in Well (ft)</u>	<u>CEMENT: Fill-up (Cu. Ft.)/CTS</u>
Conductor	20"	New	H-40	94#	80	80	CTS, 77 Cu. Ft.
Fresh Water	13-3/8"	New	J-55	54.5#	300	300	CTS, 417 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	3050	3050	CTS, 1242 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	23#	24000	24000	CTS, 6191 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#			
Liners							

<b>TYPE</b>	<u>Size (in)</u>	<u>Wellbore Diameter (in)</u>	<u>Wall Thickness (in)</u>	<u>Burst Pressure (psi)</u>	<u>Anticipated Max. Internal Pressure (psi)</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
Conductor	20"	24"	0.438"	1530	50	Class A	~1.18
Fresh Water	13-3/8"	17-1/2"	0.38"	2730	1000	Class A	~1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	1500	Class A	~1.18
Intermediate							
Production	5-1/2"	8-3/4" & 8-1/2"	0.415"	12,630	2500	Lead-H/POZ & Tail - H	H/POZ~1.44 & H~1.8
Tubing	2-3/8"	4.778"	0.19"	11,200			
Liners							

**PACKERS**

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

REVISIONS  
and Date (in) (in) (in) (in)  
ISQS 0.2.11.1  
To Information (in) (in) (in) (in)  
not for (in) (in) (in) (in)

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

Antero plans to pump Slickwater into the Marcellus Shale formation in order to ready the well for production. The fluid will be comprised of approximately 99 percent water and sand, with less than 1 percent special-purpose additives as shown in the attached "List of Anticipated Additives Used for Fracturing or Stimulating Well."

Anticipated Max Pressure - 9300 lbs  
Anticipated Max Rate - 80 bpm

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 26.43 acres

22) Area to be disturbed for well pad only, less access road (acres): 8.13 acres

23) Describe centralizer placement for each casing string:

Conductor: no centralizers  
Surface Casing: one centralizer 10' above the float shoe, one on the insert float collar and one every 4th joint spaced up the hole to surface.  
Intermediate Casing: one centralizer above float joint, one centralizer 5' above float collar and one every 4th collar to surface.  
Production Casing: one centralizer at shoe joint and one every 3 joints to top of cement in intermediate casing.

24) Describe all cement additives associated with each cement type:

Conductor: no additives, Class A cement.  
Surface: Class A cement with 2-3% calcium chloride and 1/4 lb of flake  
Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat  
Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.05% C-51  
Production: Tail cement- Class H + 45 PPS Calcium Carbonate + 1.0% FL-160 + 0.2% ACGB-47 + 0.05% ACSA-51 + 0.2% ACR-20

25) Proposed borehole conditioning procedures:

Conductor: blowhole clean with air, run casing, 10 bbls fresh water.  
Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer.  
Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate 40 bbls brine water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water.  
Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to base of curve, pump high viscosity sweep, trip to top of curve, trip to bottom, circulate, pump high viscosity sweep, trip out, run casing, circulate 10 bbls fresh water, pump 48 bbls barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

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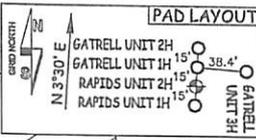
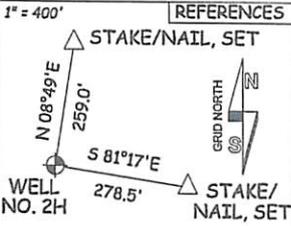
\*Note: Attach additional sheets as needed.

LATITUDE 39°25'00" 3,201'

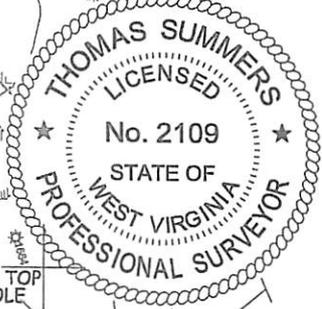
LATITUDE 39°27'30" 8,724'

8,442' LONGITUDE 80°45'00" 10,583' LONGITUDE 80°45'00"

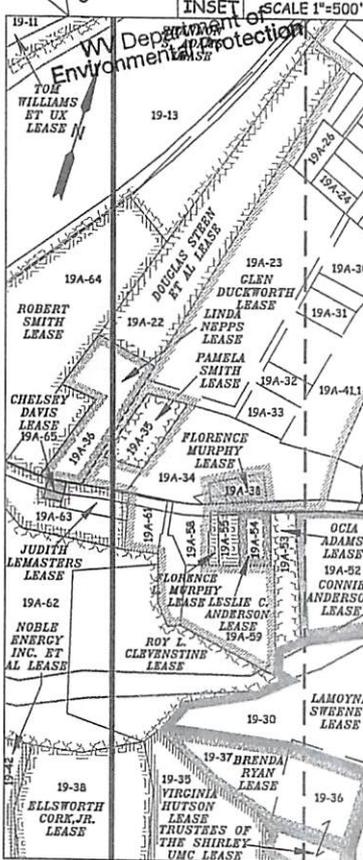
Antero Resources Corporation Well No. Rapids Unit 2H



NOTES: WELL 2H TOP HOLE INFORMATION: N: 327,929ft E: 1,643,538ft LAT: 39°23'36.56" LON: 80°45'40.77" BOTTOM HOLE INFORMATION: N: 341,041ft E: 1,638,196ft LAT: 39°25'45.40" LON: 80°46'51.18" WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH TRIMBLE GEOXT SUBMETER MAPPING GRADE GPS UNIT. PLAT ORIENTATION, CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH. (NAD) 83 (UTM) ZONE 17 COORDS: WELL 2H TOP HOLE INFORMATION: N: 4,360,480m E: 520,567m BOTTOM HOLE INFORMATION: N: 4,364,448m E: 518,873m



RECEIVED Office of Oil and Gas JUL 29 2021



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16-02 MICHAEL SLOSS
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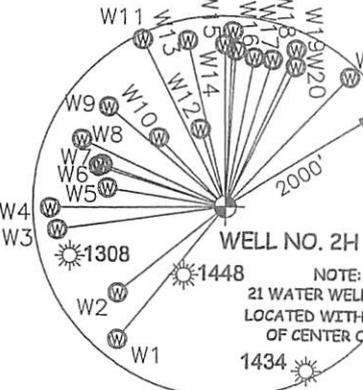


Table with columns: LINE, BEARING, DIST. Lists bearings and distances for lines W1 through W21.

NOTE: NO OCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2,500) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER DAIRY CATTLE OR POULTRY HUSBANDRY ARE LOCATED WITHIN SIX HUNDRED TWENTY-FIVE (625) FEET OF THE CENTER OF THE WELL PAD. (NAD) 27 (UTM) ZONE 17 COORDS: WELL 2H TOP HOLE INFORMATION: N: 14,305,294ft E: 1,707,847ft POINT OF ENTRY INFORMATION: N: 14,304,457ft E: 1,706,856ft BOTTOM HOLE INFORMATION: N: 14,318,311ft E: 1,702,290ft

JOB # 18-003WA DRAWING # RAPIDS2H SCALE 1" = 2000' MINIMUM DEGREE OF ACCURACY SUBMETER PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS

THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE RULES ISSUED AND PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION. STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS WILLLOW LAND SURVEYING PLLC 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415



LEGEND: Surface Owner Boundary Lines +/-, Interior Surface Tracts +/-, Existing Fence, Found monument, as noted. THOMAS SUMMERS P.S. 2109 DATE 05/17/21 OPERATOR'S WELL# RAPIDS UNIT #2H

WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL 47 - 095 - 02738 MOD (IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X LOCATION: ELEVATION 935' - ASBUILT WATERSHED McELROY CREEK QUADRANGLE SHIRLEY 7.5' DISTRICT McELROY COUNTY TYLER SURFACE OWNER JOHN SHEPHERD ACREAGE 31.75 ACRES +/- OIL & GAS ROYALTY OWNER LAMOYNE SWEENEY; EDGAR B. HARTLEY; ANNA SWEENEY; VIRGINIA HUTSON; ELLSWORTH CORK, JR.; ROY L. CLEVENSTINE; LEASE ACREAGE 72.28 AC±; 16 AC±; 3.08 AC±; 15.12 AC±; 4 AC±; 6.63 AC±; JUDITH LEMASTERS; GLEN DUCKWORTH; LINDA NEPPS; DOUGLAS STEEN ET AL; ROBERT SMITH; SHANNON S. ADAMS; TOM WILLIAMS ET UX; JAMES MALLOY ET UX; 1 AC±; 29.92 AC±; 1 AC±; 3 AC±; 7.15 AC±; 13.975 AC±; 40 AC±; 90.1 AC±; REBECCA WILLIAMS; ROSEMARY HAUGHT; HENRY M. WALLACE ET UX; JIMMY J. GRIFFIN ET UX; BOUNTY MINERALS, LLC; JAMES A. GROVE; BRC APPALACHIAN I, LLC 210 AC±; 98.5 AC±; 219.39 AC±; 236 AC±; 502.8 AC±; 120 AC±; 70 AC± PROPOSED WORK: DRILL X CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X (SPECIFY) PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL TARGET FORMATION MARCELLUS PLUG & ABANDON CLEAN OUT & REPLUG WELL OPERATOR ANTERO RESOURCES CORP. ESTIMATED DEPTH 7,100' TVD 24,000' MD ADDRESS 1615 WYNKOOP ST. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM ADDRESS 5400 D BIG TYLER ROAD CHARLESTON, WV 25313

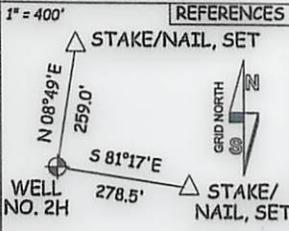
08/06/2021

COUNTY NAME PERMIT

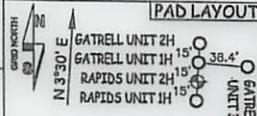
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Antero Resources Corporation  
Well No. Rapids Unit 2H



PAD LAYOUT

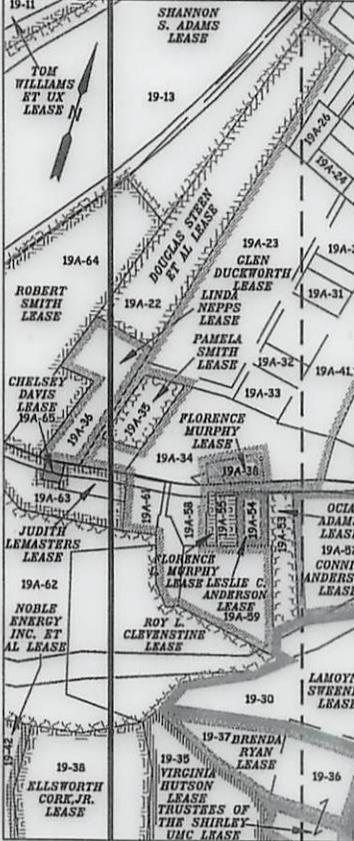


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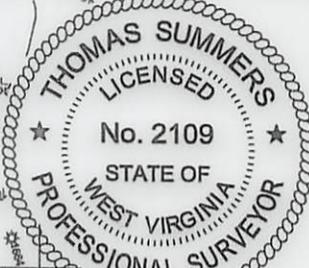
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WV NORTH ZONE  
GRID NORTH

INSET SCALE 1"=500'



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LINE	BEARING	DIST.
W1	S 38°38' W	1787.8'
W2	S 50°59' W	1435.2'
W3	S 81°39' W	1764.3'
W4	S 89°00' W	1819.7'
W5	N 81°26' W	1237.3'
W6	N 72°47' W	1377.6'
W7	N 71°34' W	1346.1'
W8	N 65°17' W	1640.8'
W9	N 49°29' W	1592.4'
W10	N 43°57' W	993.0'
W11	N 26°12' W	1944.0'
W12	N 17°41' W	851.8'
W13	N 12°43' W	1781.2'
W14	N 00°13' W	1701.9'
W15	N 02°18' E	1838.5'
W16	N 03°44' E	1639.4'
W17	N 10°47' E	1592.5'
W18	N 17°35' E	1618.9'
W19	N 24°01' E	1806.6'
W20	N 26°22' E	1642.9'
W21	N 43°22' E	1882.5'

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STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS

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STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
WILLOW LAND SURVEYING PLLC  
220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

LEGEND  
--- Surface Owner Boundary Lines +/-  
--- Interior Surface Tracts +/-  
X Existing Fence  
⊕ Found monument, as noted

THOMAS SUMMERS P.S. 2109  
DATE 05/17/21  
OPERATOR'S WELL# RAPIDS UNIT #2H

WELL TYPE: OIL \_\_\_ GAS X LIQUID INJECTION \_\_\_ WASTE DISPOSAL \_\_\_  
(IF "GAS") PRODUCTION X STORAGE \_\_\_ DEEP \_\_\_ SHALLOW X  
LOCATION: ELEVATION 935'-ASBUILT WATERSHED McELROY CREEK QUADRANGLE SHIRLEY 7.5' DISTRICT McELROY COUNTY TYLER  
SURFACE OWNER JOHN SHEPHERD ACREAGE 31.75 ACRES +/-  
OIL & GAS ROYALTY OWNER LAMOYNE SWEENEY; EDGAR B. HARTLEY; ANNA SWEENEY; VIRGINIA HUTSON; ELLSWORTH CORK, JR.; ROY L. CLEVENSTINE; LEASE ACREAGE 72.28 AC±; 16 AC±; 3.08 AC±; 15.12 AC±; 4 AC±; 6.63 AC±; JUDITH LEMASTERS; GLEN DUCKWORTH; LINDA NEPPS; DOUGLAS STEEN ET AL; ROBERT SMITH; SHANNON S. ADAMS; TOM WILLIAMS ET UX; JAMES MALLOY ET UX; 1 AC±; 29.92 AC±; 1 AC±; 3 AC±; 7.15 AC±; 13.975 AC±; 40 AC±; 90.1 AC±; REBECCA WILLIAMS; ROSEMARY HAUGHT; HENRY M. WALLACE ET UX; JIMMY J. GRIFFIN ET UX; BOUNTY MINERALS, LLC; JAMES A. GROVE; BRC APPALACHIAN I, LLC 210 AC±; 98.5 AC±; 219.39 AC±; 236 AC±; 502.8 AC±; 120 AC±; 70 AC±  
PROPOSED WORK: DRILL X CONVERT \_\_\_ DRILL DEEPER \_\_\_ REDRILL \_\_\_ FRACTURE OR STIMULATE X  
PLUG OFF OLD FORMATION \_\_\_ PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL \_\_\_  
(SPECIFY) \_\_\_ PLUG & ABANDON \_\_\_ CLEAN OUT & REPLUG \_\_\_  
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,100' TVD 24,000' MD  
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM  
ADDRESS 1615 WYNKOOP ST. ADDRESS 5400 D BIG TYLER ROAD  
FORM WW-6 DENVER, CO 80202 ADDRESS CHARLESTON, WV 25313

8,442' LONGITUDE 80°45'00" 10,583' LONGITUDE 80°45'00"

08/06/2021



July 28, 2021

Antero Resources  
1615 Wynkoop Street  
Denver, CO 80202  
Office 303.357.7310  
Fax 303.357.7315

West Virginia Department of Environmental Protection  
Office of Oil and Gas  
Attn: Mr. Taylor Brewer  
601 57<sup>th</sup> Street  
Charleston, WV 25304

Mr. Brewer:

Antero Resources Corporation (Antero) would like to submit the following permit modifications for approved well on the Shepherd Pad. We are requesting to extend the wellbore casing for the coal/intermediate string.

Attached you will find the following documents:

- REVISED Form WW-6B
- REVISED Mylar Plat

If you have any questions please feel free to contact me at (303) 357-7182.

Thank you in advance for your consideration.

Sincerely,

Mallory Stanton  
Permitting Supervisor  
Antero Resources Corporation

Enclosures

RAPIDS UNIT 1H SHEPHERD PAD  
 # 231960 - 7/27/21 \$2,500  
 RAPIDS UNIT #2H SHEPHERD PAD  
 # 231961 - 7/27/21 \$2,500  
 GATRELL UNIT 1H SHEPHERD PAD  
 # 231962 - 7/27/21 \$2,500  
 GATRELL UNIT 2H SHEPHERD PAD  
 # 231963 7/27/21 \$2,500

RECEIVED  
Office of Oil and Gas

JUL 29 2021

WV Department of  
Environmental Protection

08/06/2021



Stansberry, Wade A <wade.a.stansberry@wv.gov>

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## Modification H6A Horizontal Well Work Permit (API: 47-095-02738)

1 message

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**Stansberry, Wade A** <wade.a.stansberry@wv.gov>

Tue, Aug 3, 2021 at 10:05 AM

To: Mallory Stanton <mstanton@anteroresources.com>, Dani DeVito <ddevito@shalepro.com>

Cc: Derek Haught <derek.m.haught@wv.gov>, ljackson@wvassessor.com, jturner@wvassessor.com

I have attached a copy of the newly issued well [permit](#) number "RAPIDS UNIT 2H", API (47-095-02738). This will serve as your copy.

If you have any questions, then [please](#) contact us here at the Office of Oil and Gas.

Thank you,

**Wade A. Stansberry**

**Environmental Resource Specialist 3**

**West Virginia Department of Environmental Protection**

**Office of Oil & Gas**

**601 57th St. SE**

**Charleston, WV 25304**

**(304) 926-0499 ext. 41115**

**(304) 926-0452 fax**

**[Wade.A.Stansberry@wv.gov](mailto:Wade.A.Stansberry@wv.gov)**

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 **47-095-02738 - mod.pdf**  
2749K

08/06/2021